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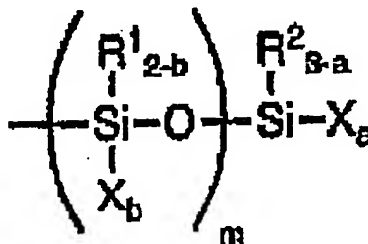
<p>(30) Priority:</p> <p>(43) Date of application publication: 10.02.98</p> <p>(84) Designated contracting states:</p>	<p>(71) Applicant: KANEGAFUCHI CHEM IND CO LTD</p> <p>(72) Inventor: FUJISAWA HIROSHI SAKAGUCHI MASAFUMI TAKASE JUNJI</p> <p>(74) Representative:</p>
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(54) EMULSION COMPOSITION

(57) Abstract:

PROBLEM TO BE SOLVED: To obtain an emulsion composition, capable of providing an emulsion affording a uniform and thin coating film, excellent in gas barrier properties, weather resistance and electrical insulating properties and suitable as a coating agent, etc., by including a saturated hydrocarbon-based polymer containing specific silicon-containing groups therein.

SOLUTION: This cross-linkable type water-dispersible composition comprises a saturated hydrocarbon-based polymer containing one or more silicon-containing groups, having hydroxyl groups or hydrolyzable groups such as an alkoxy group bonded to silicon atom and cross-linkable by forming siloxane bonds such as a group represented by the formula {R1 and R2 are each a 1-20C alkyl, a 6-20C aryl, a 7-20C aralkyl or a triorganosiloxy group represented by R3SiO (R3 is a 1-20C monovalent hydrocarbon); Xs are each the hydroxyl group or hydrolyzable



group; (a) is 0-3; (b) is 0-2;
[(a)+Σ(b)] ≥ 10 (m) is 0-19}
such as an isobutylene-based
polymer and further preferably
an emulsifying agent.

Furthermore, the resultant
cross linkable type water-
dispersible composition is used
to provide a coating agent or a
textile treating agent.

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(54) [Title of the Invention]

EMULSION COMPOSITION

(57) [Abstract]

[Object] The object of the invention of the present application is to provide a water-dispersible composition of a saturated hydrocarbon type polymer such as an emulsion of a polyisobutylene, which is cross-linkable.

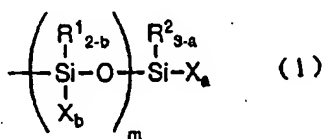
[Solution] The invention of the present application relates to a composition in which a saturated hydrocarbon type polymer which has hydroxy groups or hydrolyzable groups bonded to silicon atoms, and which has silicon-containing groups that can be crosslinked by the formation of siloxane bonds, is dispersed in water; more specifically, the invention of the present application relates to an emulsion of a polyisobutylene which has silicon groups such as $(\text{CH}_3\text{O})_3\text{Si}-$.

[Claims]

[Claim 1] A crosslinkable water-dispersible composition which is characterized by the fact that said composition contains a saturated hydrocarbon type polymer which has hydroxy groups or hydrolyzable groups bonded to silicon atoms, and which has at least one silicon-containing group that can be crosslinked by the formation of a siloxane bond.

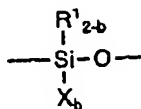
[Claim 2] The crosslinkable water-dispersible composition claimed in Claim 1, which is characterized by the fact that the silicon-containing group that can be crosslinked by the formation of a siloxane bond is a group expressed by general formula (1)

[Chemical Formula 1]



(In the abovementioned formula, R^1 and R^2 are both alkyl groups with 1 to 20 carbon atoms, aryl groups with 6 to 20 carbon atoms, aralkyl groups with 7 to 20 carbon atoms or triorganosiloxy groups expressed by $\text{R}^3\text{SiO}-$ (R^3 is a monovalent hydrocarbon group with 1 to 20 carbon atoms; the three groups indicated by R^3 may be the same or different); in cases where two or more groups indicated by R^1 or R^2 are present, these groups may be the same or different. X indicates a hydroxy group or hydrolyzable group; in cases where two or more of these groups are present, the groups may be the same or different. a is an integer from 0 to 3, and b is an integer from 0 to 2. However, $a + \sum b \geq 1$. Furthermore, b in the m groups expressed by

[Chemical Formula 2]



may be the same or different. m is an integer from 0 to 19.)

[Claim 3] The crosslinkable water-dispersible composition claimed in Claim 1 or Claim 2, which is characterized by the fact that the hydrolyzable group is a hydrogen atom, alkoxy group, acyloxy group, ketomethoxy group, amino group, amido group, aminooxy group, mercapto group or alkenyloxy group.

[Claim 4] The crosslinkable water-dispersible composition claimed in Claim 1 or Claim 2, which is characterized by the fact that the hydrolyzable group is an alkoxy group.

[Claim 5] The crosslinkable water-dispersible composition claimed in any of Claims 1 through 4, which is characterized by the fact that the saturated hydrocarbon type polymer is an isobutylene type polymer.

[Claim 6] The crosslinkable water-dispersible composition claimed in any of Claims 1 through 5, which is characterized by the fact that said composition contains an emulsifying agent.

[Claim 7] A coating agent or fiber treatment agent consisting of the composition claimed in any of Claims 1 through 6.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention] The invention of the present application relates to a dispersible composition which can be appropriately used in various types of coating agents or fiber treatment agents for construction materials, automobiles, household products or plastics, etc.

[0002]

[Prior Art] It has been demonstrated that cured isobutylene type polymers that have hydrolyzable silyl groups on their terminals show high gas barrier properties, good weather resistance and good electrical insulating properties.

[0003]

[Problems to Be Solved by the Invention] However, in cases where such substances are used as coating agents or fiber treatment agents, it is difficult to obtain a thin, uniform coating film.

[0004]

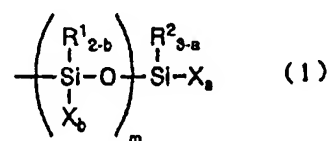
[Means Used to Solve the Abovementioned Problems] The inventors of the present application conducted diligent research in order to solve the abovementioned problem. As a result, the inventors succeeded in obtaining a thin, uniform coating film by emulsifying an isobutylene type polymer, and thus perfected the invention of the present application. Specifically, the invention of the present application relates to a crosslinkable water-dispersible composition containing a saturated hydrocarbon type polymer which has hydroxy groups or hydrolyzable groups bonded to silicon atoms, and which has at least one silicon-containing group that can be crosslinked by forming a siloxane bond.

[0005]

[Working Configurations of the Invention] A saturated hydrocarbon type polymer (hereafter referred to as "saturated hydrocarbon type polymer A") which has hydroxy groups or hydrolyzable groups bonded to silicon atoms, and which has at least one silicon-containing group that can be crosslinked by forming a siloxane bond (i. e., a reactive silicon group) is used in the invention of the present application. The abovementioned reactive silicon group used in the invention of the present application is a well-known functional group. Typical examples of such groups include groups expressed by general formula (1):

[0006]

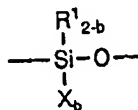
[Chemical Formula 3]



[0007] (In the abovementioned formula, R^1 and R^2 are both alkyl groups with 1 to 20 carbon atoms, aryl groups with 6 to 20 carbon atoms, aralkyl groups with 7 to 20 carbon atoms or triorganosiloxy groups expressed by R^3SiO- (R^3 is a monovalent hydrocarbon group with 1 to 20 carbon atoms; the three groups indicated by R^3 may be the same or different); in cases where

two or more groups indicated by R^1 or R^2 are present, these groups may be the same or different. X indicates a hydroxy group or hydrolyzable group; in cases where two or more of these groups are present, the groups may be the same or different. a is an integer from 0 to 3, and b is an integer from 0 to 2. However, $a + \Sigma b \geq 1$. Furthermore, b in the m groups expressed by

[0008]



[0009] may be the same or different. m is an integer from 0 to 19.)

[0010] There are no particular restrictions on the hydrolyzable groups in general formula (1); conventional hydrolyzable groups may be used. Examples of such groups include hydrogen atoms, alkoxy groups, acyloxy groups, ketomethoxy groups, amino groups, amido groups, aminooxy groups, mercapto groups and alkenyloxy groups, etc. Among these groups, alkoxy groups such as methoxy groups and ethoxy groups, etc., are especially desirable from the standpoints of hydrolyzability under mild conditions and ease of handling.

[0011] One to three such hydrolyzable groups or hydroxy groups may be bonded to a single silicon atom, and it is desirable that $(a + \Sigma b)$ be in the range of 1 to 5. In cases where two or more hydrolyzable groups or hydroxy groups are bonded to a reactive silicon group, these hydrolyzable groups or hydroxy groups may be the same or different. Such a reactive silicon group may be formed by a single silicon atom or by two or more silicon atoms; however, in the case of silicon atoms connected by siloxane bonds, etc., it is desirable that the number of silicon atoms be 20 or fewer. In particular, reactive silicon groups expressed by general formula (2)

[0012]

[Chemical Formula 5]



(in the above formula, R^2 , X and a have the same meanings as described above) are easily obtained, and are therefore desirable.

[0014] Furthermore, R^1 and R^2 in the abovementioned general formulae (1) and (2) are (for example) alkyl groups such as methyl groups or ethyl groups, etc., cycloalkyl groups such as cyclohexyl groups, etc., aryl groups such as phenyl groups, etc., aralkyl groups such as benzyl groups, etc., or triorganosiloxy groups expressed by R^3_3SiO- in which R^3 indicates a methyl group or phenyl group, etc. (preferably). Methyl groups are especially desirable as R^1 and R^2 . Reactive silicon groups are present at the rate of at least 1 group, and preferably 1.1 to 5 groups, per molecule of the abovementioned saturated hydrocarbon type polymer. If the number of reactive silicon groups contained in each molecule is less than 1, the curability of the composition becomes insufficient, so that it becomes difficult to obtain good rubber elastic behavior.

[0015] The abovementioned reactive silicon groups may be present on the ends of the molecular chains of the saturated hydrocarbon type polymer, in internal positions in said chains, or both on the ends of the chains and in internal positions in the chains. In cases where reactive silicon groups are present on the ends of the molecular chains, the quantity of effective network chains of the saturated hydrocarbon type polymer component contained in the cured product that is finally obtained is increased, so that a rubber-form cured product can easily be obtained. From this and other standpoints, such a positioning of the reactive silicon groups is especially desirable. Furthermore, saturated hydrocarbon type polymers containing such reactive silicon groups may be used singly, or may be used in combinations consisting of two or more polymers.

[0016] The saturated hydrocarbon type polymer A used in the invention of the present application can be manufactured by the following methods: (1) a method in which polymerization is performed using an olefin compound with 1 to 6 carbon atoms such as ethylene, propylene, 1-butene or isobutylene, etc., as the principal monomer, or (2) a method in which a diene type compound such as butadiene or isoprene, etc., is polymerized alone, or an olefin compound of the abovementioned type and a diene type compound are copolymerized, after which hydrogenation is performed, etc. However, from the standpoints of easy introduction of functional groups onto the terminals, easy control of the molecular weight and ability to increase the number of terminal functional groups, it is desirable that the polymer used be an isobutylene type polymer, hydrogenated polybutadiene type polymer or hydrogenated polyisoprene type polymer. In the case of isobutylene type polymers, all of the monomer units may be formed by isobutylene units; however, the polymer may also contain monomer units that are copolymerizable with isobutylene. It is desirable that the content of such monomer units be 50% (wt %, same below) of the isobutylene type polymer or less, preferably 30% or less, and even more preferably 10% or less.

[0017] Examples of such monomer components include olefins with 4 to 12 carbon atoms, vinyl ethers, aromatic vinyl compounds, vinylsilanes and allylsilanes, etc. [Concrete] examples of such copolymer components (monomer components) include 1-butene, 2-butene, 2-methyl-1-butene, 3-methyl-1-butene, pentene, 4-methyl-1-pentene, hexene, vinylcyclohexane, methylvinyl ether, ethylvinyl ether, isobutylvinyl ether, styrene, α -methylstyrene, dimethylstyrene, p-t-butoxystyrene, p-hexenyloxystyrene, p-allyloxystyrene, p-hydroxystyrene, β -pinene, indene, vinyl dimethylmethoxysilane, vinyl trimethylsilane, divinyl dimethoxysilane, divinyl dimethylsilane, 1,3-divinyl-1,1,3,3-tetramethyldisiloxane, trivinyl methylsilane, tetravinylsilane, allyl dimethylmethoxysilane, allyl trimethylsilane, diallyl dimethoxysilane,

diallyldimethylsilane, γ -methacryloyloxypropyltrimethoxysilane and γ -methacryloyloxypropylmethyldimethoxysilane, etc.

[0018] If vinylsilanes or allylsilanes are used as the [abovementioned] monomers that are copolymerizable with isobutylene, the silicon content is increased so that there is an increase in the number of groups that can be used as the groups of a silane coupling agent, thus improving the adhesive properties of the composition obtained.

[0019] As in the case of the abovementioned isobutylene type polymers, other monomer units besides the monomer units constituting the chief component may be contained in hydrogenated polybutadiene type polymers or other saturated hydrocarbon type polymers as well.

[0020] Furthermore, the saturated hydrocarbon type polymer A of the invention of the present application may also contain small amounts of monomers that leave a double bond following polymerization, such as butadiene, isoprene, 1,13-tetradecadiene, 1,9-decadiene or 1,5-hexadiene, within limits that allow the object of the invention of the present application to be achieved, i. e., at the rate of 10% or less, preferably 5% or less, and even more preferably 1% or less.

[0021] It is desirable that the saturated hydrocarbon type polymer A be an isobutylene type polymer, a hydrogenated polyisoprene or a hydrogenated polybutadiene type polymer. It is desirable that the number average molecular weight of this polymer be in the range of approximately 500 to 100,000; a number average molecular weight of 500 to 40,000 is even more desirable, and a liquid-form polymer or polymer possessing fluidity with a number average molecular weight of approximately 1,000 to 40,000 is especially desirable from the standpoint of ease of handling, etc. Furthermore, in regard to the molecular weight distribution (M_w/M_n), a narrow molecular weight distribution is desirable in that the viscosity at the same molecular weight is lower in the case of such a distribution.

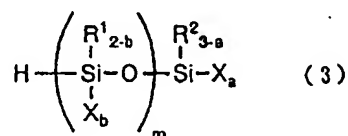
[0022] The method used to manufacture the abovementioned saturated hydrocarbon type polymer with reactive silicon groups will be described using the cases of an isobutylene type polymer and a hydrogenated polybutadiene type polymer as examples. Among isobutylene type polymers that have reactive silicon groups, isobutylene type polymers that have reactive silicon groups on the ends of the molecules can be manufactured using terminal-functional type, preferably completely terminal-functional type, isobutylene type polymers obtained by a polymerization method known as the "inifer" method (a cationic polymerization method using specified compounds known as "inifers", which combine the functions of an initiator and a chain transfer agent).

[0023] In the case of the inifer method, a polymer which has mainly halogen atoms on the ends of the molecules is obtained; however, reactive silicon groups can be introduced using the reactivity of these halogen atoms. For example, a method can be used in which a polyisobutylene that has unsaturated groups on the ends of the molecules is obtained by means of a de-halogenating hydrogenation reaction of a polymer of the abovementioned type or a reaction that introduces unsaturated groups onto such a polymer using an unsaturated silane compound of the type described in Japanese Patent Application Kokai No. Sho 63-105005, after which

reactive silicon groups are introduced onto the polymer by an addition reaction (known as a hydrosilylation reaction) of a hydrosilane compound expressed by general formula (3) (this compound is a compound in which a hydrogen atom is bonded to the group expressed by general formula (1)), preferably a compound expressed by general formula (4), using a platinum catalyst.

[0024]

[Chemical Formula 6]



[0025] (In the above formula, R^1 , R^2 , X , a and b have the same meanings as described above.)

[0026]

[Chemical Formula 7]



[0027] (In the above formula, R^2 , X and a have the same meanings as described above.)

[0028] Concrete examples of hydrosilane compounds expressed by the abovementioned general formula (3) include halogenated silanes such as trichlorosilane, methyldichlorosilane, dimethylchlorosilane and phenyldichlorosilane, etc.; alkoxy silanes such as trimethoxysilane, triethoxysilane, methyldiethoxysilane, methyldimethoxysilane and phenyldimethoxysilane, etc.; acyloxysilanes such as methyldiacetoxysilane and phenyldiacetoxysilane, etc., and ketomethoxysilanes such as bis(dimethylketoximate)methylsilane and bis(cyclohexylketoximate)methylsilane, etc. However, the present invention is not limited to these compounds. Among these compounds, alkoxy silanes are especially desirable. Examples of such a method of manufacture are described in the specifications of Japanese Patent Application Kokai No. Sho 63-6003, Japanese Patent Application Kokai No. Sho 63-6041, Japanese Patent Application Kokai No. Sho 63-254149, Japanese Patent Application Kokai No. Sho 64-22904 and Japanese Patent Application Kokai No. Sho 64-38407, etc.

[0029] Furthermore, isobutylene type polymers which have reactive silicon groups within the molecule can be manufactured by adding and copolymerizing vinylsilanes or allylsilanes that have reactive silicon groups with monomers consisting chiefly of isobutylene.

[0030] Moreover, isobutylene type polymers which have reactive silicon groups both within the molecule and on the ends of the molecule can be manufactured by copolymerizing vinylsilanes or allylsilanes, etc., that have reactive silicon groups in addition to the isobutylene monomer constituting the chief component in the polymerization process used to manufacture the abovementioned isobutylene type polymers that have reactive silicon groups on the ends of the molecules, and then introducing reactive silicon groups onto the ends of the molecules.

[0031] Concrete examples of vinylsilanes and allylsilanes, etc., that have such reactive silicon groups include vinyltrichlorosilane, vinylmethyldichlorosilane, vinyldimethylchlorosilane, vinyldimethylmethoxysilane, divinylchlorosilane, divinylmethoxysilane, allylchlorosilane, allylmethyldichlorosilane, allyldimethylchlorosilane, allyldimethylmethoxysilane, diallyldichlorosilane, diallyldimethoxysilane, γ -methacryloyloxypropyltrimethoxysilane and γ -methacryloyloxypropylmethyldimethoxysilane, etc.

[0032] In regard to the method used to manufacture hydrogenated polybutadiene type polymers, a hydrogenated polybutadiene type polymer which has terminal olefin groups (hereafter also referred to as a "terminal-olefin hydrogenated polybutadiene type polymer") is first manufactured by (for example) converting the hydroxy groups of a terminal-hydroxy hydrogenated polybutadiene type polymer into oxymetal groups such as $-\text{ONa}$ or $-\text{OK}$, etc., and then reacting an organo-halogen compound containing unsaturated groups, expressed by the general formula



(in the above formula, Y indicates a halogen atom such as a chlorine atom or iodine atom, etc., and R^4 indicates a divalent organic group expressed by $-\text{R}^5$ -, $-\text{R}^5-\text{OC}(=\text{O})$ - or $-\text{R}^5-\text{C}(=\text{O})$ - (R^5 is a divalent hydrocarbon group with 1 to 20 carbon atoms; desirable concrete examples include alkylene groups, cycloalkylene groups, arylene groups and aralkylene groups), with divalent groups selected from a set consisting of $-\text{CH}_2$ - and $-\text{p}-\text{R}^6-\text{C}_6\text{H}_4-\text{CH}_2$ - (R^6 is a hydrocarbon group with 1 to 10 carbon atoms) being especially desirable).

[0033] Examples of methods which can be used to convert the terminal hydroxy groups of a terminal-hydroxy hydrogenated butadiene type polymer into oxymetal groups include methods in which [such a polymer] is reacted with an alkali metal such as Na or K, etc., a metal hydride such as NaH , etc., a metal alkoxide such as NaOCH_3 , etc., or a caustic alkali such as NaOH or KOH , etc.

[0034] In the method described above, a terminal-olefin hydrogenated polybutadiene type polymer which has more or less the same molecular weight as the terminal-hydroxy hydrogenated polybutadiene type polymer used as the starting raw material is obtained. In cases where it is desired to obtain a polymer with a higher molecular weight, the molecular weight can be increased by reacting a polyvalent organo-halogen compound which contains two or more

halogen atoms per molecule, such as methylene chloride, bis(chloromethyl)benzene or bis(chloromethyl) ether, etc., prior to reacting the abovementioned organo-halogen compound containing unsaturated groups; then, a hydrogenated polybutadiene type polymer which has a higher molecular weight and which has terminal olefin groups can be obtained by reacting this polymer with the abovementioned organo-halogen compound containing unsaturated groups.

[0035] Concrete examples of organo-halogen compounds containing unsaturated groups include allyl chloride, allyl bromide, vinyl(chloromethyl)benzene, allyl(chloromethyl)benzene, allyl(bromomethyl)benzene, ally(chloromethyl) ether, allyl(chloromethoxy)benzene, 1-butenyl(chloromethyl) ether, 1-hexenyl(chloromethoxy)benzene and allyloxy(chloromethyl)benzene, etc. However, the present invention is not limited to these compounds. Among these compounds, allyl chloride is especially desirable, since it is inexpensive and reacts easily, etc. As in the case of the aforementioned isobutylene type polymers with reactive silicon groups on the ends of the molecules, the introduction of reactive silicon groups onto terminal-olefin hydrogenated polybutadiene type polymers can be achieved by means of the aforementioned hydrosilylation reaction.

[0036] In the manufacture of the water-dispersible composition of the invention of the present application, a surfactant, etc., can be used as an emulsifying agent if necessary. Examples of surfactants that can be used include carboxylates, sulfonates, sulfuric acid esters, and salts of these compounds. Concrete examples of compounds that can be used include aliphatic sulfuric acid esters such as sodium laurylsulfate, etc., benzenesulfonic acid substituted by aliphatic hydrocarbon groups, such as dodecylbenzenesulfonic acid, etc., naphthalenesulfonic acid substituted by aliphatic hydrocarbon groups, polyethylene glycol sulfuric acid esters, and laurylphosphates, etc.

[0037] Furthermore, emulsifying agents that can be used in the invention of the present application include aliphatic amine salts, aliphatic quaternary ammonium salts, benzalkonium salts, benzetonium chloride, pyridinium salts, imidazolinium salts, and calcium phosphates. Furthermore, fluorine type emulsifying agents and nonionic emulsifying agents such as polyoxyethylene alkyl ethers and polyoxyethylene alkylphenyl ethers, etc., can also be used.

[0038] Moreover, organic solvents can also be used if necessary in the invention of the present application. Ordinarily, examples of organic solvents that can be used include pentane, hexane, heptane, cyclohexane, methylcyclohexane, toluene, xylene, methyl ethyl ketone, methyl isobutyl ketone, dibutyl ether, ethyl acetate and butyl acetate, etc. Among these solvents, cyclohexane, toluene and butyl acetate, etc., are especially desirable.

[0039] Furthermore, plasticizers can also be used in the invention of the present application. Plasticizers are used to improve the fluidity and workability of the composition; all commonly used plasticizers may be used. However, it is desirable to use a plasticizer that has good compatibility with saturated hydrocarbon type polymers. Concrete examples of plasticizers with good compatibility include polybutenes, hydrogenated polybutenes, α -methylstyrene oligomers, liquid-form polybutadienes, paraffin oil, naphthene oil and atactic polypropylenes, etc. Among these compounds, hydrocarbon type compounds such as hydrogenated polybutadienes containing no unsaturated bonds, liquid-form polybutadienes, paraffin oil and atactic polypropylenes, etc.,

are especially desirable. These plasticizers may be used singly, or may be used in combinations consisting of two or more plasticizers. Furthermore, even plasticizers that have a poor compatibility when used alone may be used if the compatibility is improved by combined use with the abovementioned hydrocarbon type compounds.

[0040] Silanol condensation catalysts can also be used in the invention of the present application. Concrete examples of such silanol condensation catalysts include titanate acid esters such as tetrabutyl titanate and tetrapropyl titanate, etc.; carboxylic acid salts of tins such as dibutyltin dilaurate, dibutyltin maleate, tin octylate and tin naphthenate, etc.; reaction products of dibutyltin oxide with phthalic acid esters; dibutyltin acetylacetonate; organo-aluminum compounds such as aluminum trisacetylacetonate, aluminum trisethylacetoacetate and diisopropoxyaluminum ethylacetoacetate, etc.; chelate compounds such as zirconium tetraacetylacetonate and titanium tetraacetylacetonate, etc.; lead octylate; amine type compounds such as butylamine, octylamine, laurylamine, dibutylamine, monoethanolamine, diethanolamine, triethanolamine, diethylenetriamine, triethylenetetramine, oleylamine, cyclohexylamine, benzylamine, diethylaminopropylamine, xylylenediamine, triethylenediamine, guanidine, diphenylguanidine, 2,4,6-tris(dimethylaminomethyl)phenol, morpholine, N-methylmorpholine, 2-ethyl-4-methylimidazole and 1,8-diazabicyclo(5,4,0)undecene-7 (DBU), etc., or salts of such amine type compounds with carboxylic acids; low-molecular-weight polyamide resins obtained from an excess of a polyamine and a polybasic acid; reaction products of an excess of a polyamine with an epoxy compound; silanol composite catalysts, e. g., silane coupling agents with amino groups such as γ -aminopropyltrimethoxysilane and N-(β -aminoethyl)aminopropylmethyldimethoxysilane, etc.; and other universally known silanol condensation catalysts such as acidic catalysts and basic catalysts, etc.

[0041] These catalysts may be used singly or in combinations consisting of two or more catalysts. The amount of silanol condensation catalyst used is preferably about 0.1 to 20 parts by weight, and even more preferably 1 to 10 parts by weight, per 100 parts by weight of the saturated hydrocarbon type polymer A constituting the [main] component.

[0042] In the invention of the present application, the amount of water used in the water-dispersible composition is ordinarily 25 to 1500 parts per 100 parts of the saturated hydrocarbon type polymer A possessing reactive silicon groups; however, the use of 100 to 1000 parts of water is even more desirable.

[0043] There are no particular restrictions on the method used to prepare the crosslinkable water-dispersible composition of the invention of the present application; however, it is desirable that the composition be agitated during preparation. A homogenizer, homo-mixer, rolls or kneader, etc., can be used for this agitation. The crosslinkable water-dispersible composition of the invention of the present application can be used in various applications. Especially desirable applications are coating agents and fiber treatment agents.

[0044]

[Working Examples]

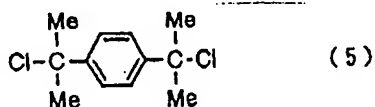
Example of Manufacture 1

Manufacture of Saturated Hydrocarbon Type Polymer A

7.5 moles of a compound (P-DCC) expressed by general formula (5)

[0045]

[Chemical Formula 8]

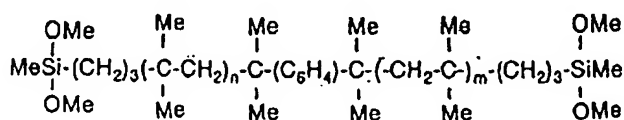


[0046] was placed in a 1-L pressure-resistant glass autoclave, and the air inside the autoclave was replaced with nitrogen after agitating vanes, a three-way cock and a vacuum line were attached. Afterward, solvents dried by means of a molecular sieve treatment, i. e., 330 mL of toluene and 141 mL of hexane, were introduced into the autoclave by means of a syringe while nitrogen was caused to flow from one direction via the three-way cock. Next, 3.0 mmol of α -picoline (an additive) was added. Then, a pressure-resistant glass liquefied-gas collection tube equipped with a needle valve, which contained 113 g of isobutylene that had been dehydrated by being passed through a column packed with barium oxide was connected to the three-way cock, after which the vessel proper was immersed in a dry ice – acetone bath at -70°C , and the interior of the reaction vessel was cooled for 1 hour while the contents were agitated. Following this cooling, the pressure in the interior of the polymerization vessel was reduced by means of the vacuum line, and the needle valve was then opened so that the isobutylene was introduced into the polymerization vessel via the pressure-resistant glass liquefied-gas collection tube. Afterward, the polymerization vessel was returned to normal pressure by causing nitrogen to flow from one tube of the three-way cock. Next, it was confirmed that the temperature inside the polymerization vessel was stable at -70°C , and polymerization was initiated by adding 7.18 g (3.8 mmol) of TiCl_4 by means of a syringe via the three-way cock. After 2 hours had elapsed, 2.57 g (22.5 mmol) of allyltrimethylsilane was added. After allowing a further reaction to proceed for 1 hour, the catalyst was deactivated by pouring the reaction mixture into water. Next, the organic layer was washed three times with pure water, after which a liquid-liquid separation was performed, and the solvent was distilled away under reduced pressure, so that an allyl-group-terminated isobutylene polymer was obtained. Next, 10 g of the allyl-group-terminated isobutylene polymer thus obtained was dissolved in 50 mL of n-heptane, and the temperature of this solution was elevated to approximately 70°C . Next, methyldimethoxysilane was added at the rate of 1.2 eq./allyl group, and a platinum(vinylsiloxane) complex was added at the rate of 1×10^{-4} eq./allyl group, and a hydrosilylation reaction was performed. The reaction

was tracked by FT-IR, and after approximately 4 hours it was confirmed that the absorption originating in the olefin at 1640 cm^{-1} had disappeared. Accordingly, the reaction was stopped. As a result of the reaction solution being concentrated under reduced pressure, [a product with] the following apparent structure was obtained. Thus, the desired isobutylene polymer with reactive silicon groups on both ends of the molecule was obtained.

[0047]

[Chemical Formula 9]



[0048] The yield rate was calculated from the yield of the polymer thus obtained, and Mn and Mw/Mn were determined by the GPC method, and by measuring and comparing the intensities of the resonance signals of the protons attributable to the respective terminal structures by subjecting said structures to ^1H -NMR analysis at 300 MHz (protons originating in the initiator: 6.5 to 7.5 ppm, methyl protons bonded to silicon atoms originating in the polymer terminals: 0.0 to 0.1 ppm, and methoxy protons: 3.5 to 3.5 [ppm]). The analysis values obtained for the polymer were Mn – 17500 (value calculated in terms of polystyrene), Mn/Mw = 1.30, Fn (silyl) = 2.00 (Fn (silyl) is the ratio of the number of equivalents of silyl groups in the polymer and [sic] the number of equivalents of groups originating in the initiator as determined by NMR analysis, and is viewed as an indicator of the number of terminal silyl functional groups per molecule of the isobutylene polymer).

[0049] Working Examples 1 ~ 3

An organic solvent solution or plasticizer solution of the isobutylene type polymer obtained in Example of Manufacture 1 was mixed with water, surfactants and (if necessary) a silanol condensation catalyst in the proportions shown in the table below, and the resulting mixtures were agitated at 25°C using a homogenizer, thus producing water-dispersible compositions.

[0050]

Table

	Working Example 1	Working Example 2	Working Example 3
Number of parts of polymer	100	100	100
Type of solvent	cyclohexane	toluene	polybutene OH
Number of parts of solvent	300	300	300
Number of parts of water	500	500	500
Type of emulsifying agent	sodium laurylsulfate	sodium laurylsulfate	calcium phosphate
Number of parts of emulsifying agent	2	2	2
Silanol condensation catalyst	none	none	U-220
Number of parts of condensation catalyst	-	-	2

Polybutene OH: plasticizer manufactured by Idemitsu Sekiyu Kagaku

U-220: Curing agent manufactured by Nitto Kasei

[0051] Working Example 4

The crosslinkable water-dispersible compositions obtained in Working Examples 1 through 3 were applied as coatings to a stainless steel sheet, and were cured for 3 days in an oven at 50°C, thus producing uniform coating films.

[Merits of the Invention] An emulsion that produces a thin, uniform coating film can be obtained by the method of the present application. Accordingly, such an emulsion is suitable for use in various types of coating agents and fiber treatment agents for construction materials, automobiles, household products and plastics, etc.